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A close-up photograph of a desk surface. In the foreground, there are several sheets of paper with architectural or technical sketches. A large black eraser is placed on one of the sketches. To the right, a red pencil and a green stapler are visible. The background shows more papers and a yellow object, possibly a highlighter. The overall scene suggests a design or engineering workspace.

The Role of Design in Software Product Development

Bill Buxton

Why We Need New Products



Why We Need New Products



The Bossy Rule:
*You can't milk that cow
forever*

Farmer Brown

The Economics of $n+1$ Products

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1. $\Delta I_n \geq VT$
2. *Cost of $\Delta I_n \sim O^n$*

The Economics of $n+1$ Products

1. $\Delta I_n \geq VT$
2. *Cost of $\Delta I_n \sim O^n$*
3. *Size of Addressable Market $\sim 1/n$*

Observation about Software Products

- Most companies have a poor record developing new products internally
- Most new releases are n+1 products.
- Those that are developed in-house tend to be the result of unsanctioned or irregular processes, such as skunk-works.
- Yet, new products are critical to financial future of most companies.
- These tend to be the result of mergers and acquisitions rather than in-house development

ADOBE Systems: A Case Study



Pfeiffer, Pamela (2003). *Inside the Publishing Revolution: The Adobe Story*. Berkeley: Peachpit Press.

Illustrator	Adobe	1987
Photoshop	J. & T. Knoll	1990
Premiere (ReelTime)	SuperMac	1991
Acrobat	Adobe	1993
After Effects	CoSA (Aldus)	1994 (1993)
PageMaker	Aldus	1994 (1985)
FrameMaker	Frame Technology	1995 (1986)
PageMill	Ceneca Communications	1995

Observation about Products in General

- Nevertheless, there are lots of companies have a great record developing new products internally.
- There are companies that can produce products on time and on budget.
- They can maintain high standards of quality, despite complexity.
- They are just not software companies.

Our Theme

- We can learn from these companies and industries.
- What we learn can be applied to software products.
- Much of this has to do with process.

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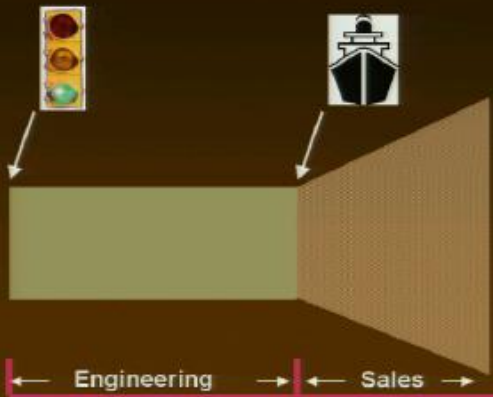
Note:

- *Generally, ROI on innovation in process > product*
- *Classic example is Dell*
- *But process + product trumps process.*

Our Thesis

- The key to this process is the incorporation of a *design phase* in advance of engineering.
- By this, we mean design in the sense that it is understood by someone who went to art college or studied industrial design.
- This is not the case today.

Status Quo



Before the Greenlight:

**Look at other industries
such as film and
automotive design.**

Film: Preproduction "The Package"

62 CUT, SEABOARD SOMETIME AND **W** APES -

The **W**APESMAN, **W**APESMAN, looks on the **W** and on the **W** in a rubber safe-pool. **W**APESMAN, **W**APESMAN, is doing a **W**APESMAN in the **W**APESMAN.

WAPESMAN: **W**APESMAN TELLING and **W**APESMAN a **W**APESMAN **W**APESMAN and **W**APESMAN, a **W**APESMAN a **W**APESMAN.

63 CLOTHES **W**APESMAN - **W**APESMAN

WAPESMAN.

64 CLOTHES **W**APESMAN - **W**APESMAN

WAPESMAN.

65 CLOTHES **W**APESMAN - **W**APESMAN

WAPESMAN of the back door CLOTHES. **W**APESMAN opens his eyes and moves his head slightly.

66 **W**APESMAN **W**APESMAN

WAPESMAN, **W**APESMAN is passionately smoking a **W**APESMAN. **W**APESMAN, **W**APESMAN is going toward him from the back, carrying some **W**APESMAN large thing wrapped in **W**APESMAN.

67 **W**APESMAN - **W**APESMAN

WAPESMAN rolls out the safe and moves to the end of the pool. **W**APESMAN rolls out, walks to the back door, takes his shirt from a chair and moves to put it on as he opens the back door and goes through.



83- **W**APESMAN to **W**APESMAN, **W**APESMAN

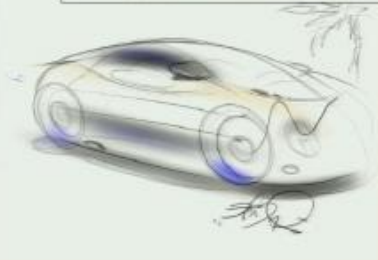


84- **W**APESMAN, **W**APESMAN



85- **W**APESMAN, **W**APESMAN

Automotive: Design Concept Models



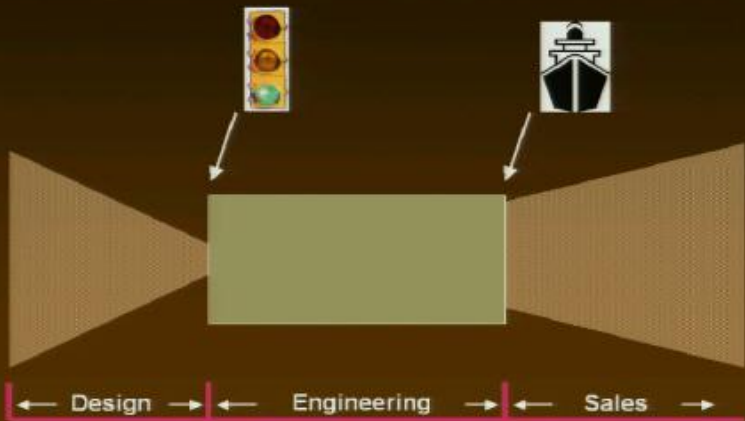
“Simple” Premise

Follow the example ...

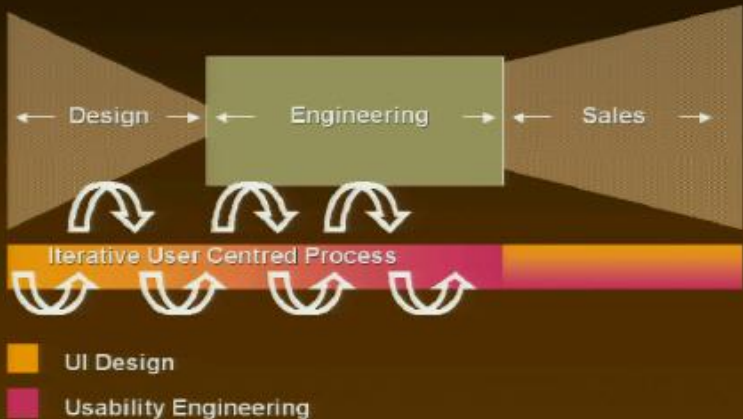
“Simple” Premise

Follow the example ...

Integrating Design



And for Clarification ...



Objective of Distinct Design Phase

- To stimulate, quality and innovation in new products.
- To refine product concepts prior to greenlight.
- To greenlight projects which are validated in the market and which are viable from a technical and business perspective.
- To ship products which meet or exceed business objectives
- Measured in customer satisfaction, quality, as well as revenue.

Design / Pre-Production in Software Development

- Primary Assumption: cost/time invested in planning < cost/time lost due to poor planning
- Customer / Market Driven
- Incremental/ staged investment
- Investment balanced with risk
- "Bar" balanced with risk & investment.
- Product Design \neq Software Design/Engineering

Entry Bar



Evaluate

Engineering

Cull

Pick

Design

Criteria Weight

Investment

time

www.billbuxton.com



Entry Bar



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Anatomy of a Green Light



Weighted measure of:

- **Product fit to market**
- **Product quality**
- **Engineering feasibility**
- **Time to market**
- **Costs to design, build, manufacture, support ...**
- **Revenue projection**
- **Alignment to strategic plan**
- **Scalability**
- **Relative merit w.r.t. other options (i.e. opportunity cost)**
- **Competitive analysis**
- **...**

Paradise by the Dashboard Light



Pick / Cull / Monitor Team:

- Marketing and Business driven
- Cross discipline/boundary representation

Of Eggs and Baskets



Size matters ...

$f_{(\text{size})}$: Risk and Cost

(1): # of projects $\sim 1/\text{size}_p$

(2): Risk_{total} $\sim 1/\#_p$ ($\# \leq \text{budget}$)

(3): TTM $\sim \text{size}_p$

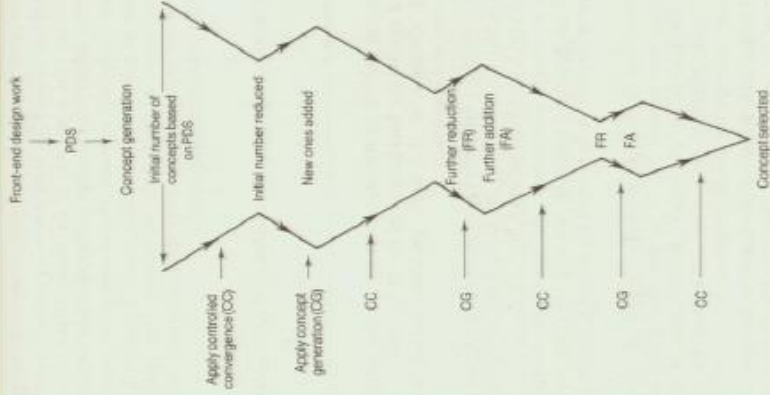
(4): Relevance_f $\sim 1/\text{size}_p$

\therefore Strong argument for smaller project(s)

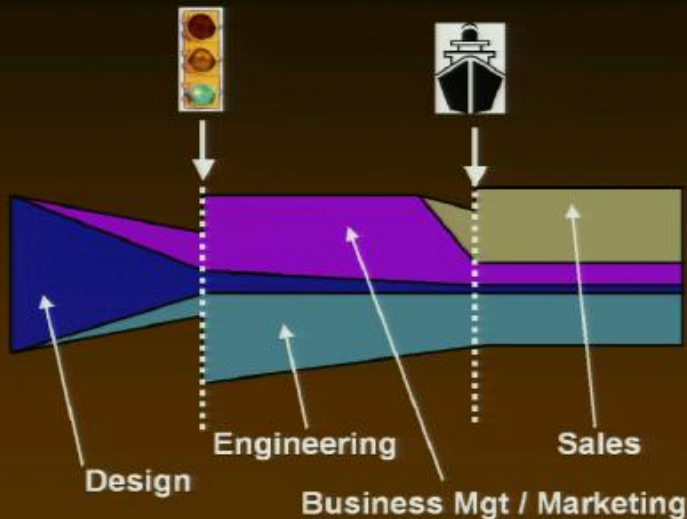
ELABORATION
opportunity-seeking

REDUCTION
decision-making

Design Process



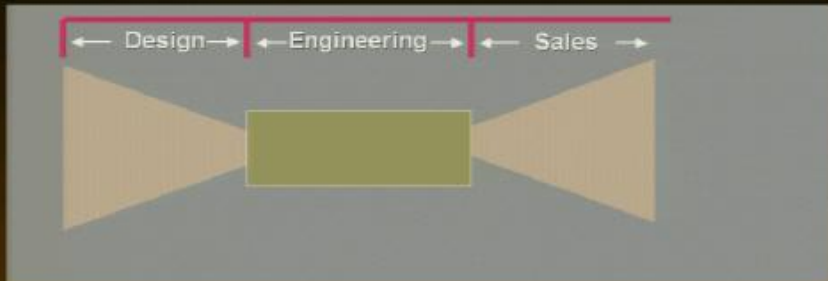
Actual Resource Allocation by Discipline



Despite Norman (*Emotional Design*, 2004)

- We are *not* all designers.
- Design is a distinct set of skills and approach to problem solving (Goel, 1995) .

Cultures & Ownership



- Management style/culture different in each link in design-engineering-sales chain
- Needs to be reflected in management structure

Executive Responsibilities

- Design:
 - Bring projects to greenlight consistent with the business plan of company.
- Engineering:
 - Responsible for bringing products that get greenlit to market.
 - Responsible for business objectives of products.
- Sales:
 - Responsible for revenue
- All:
 - Coordinate with each other @ executive level

HR Issues:

Be Careful What You Ask For ...

- Win a new product champion, lose a key player from an existing product
- Predicable that key players will be primary source of new initiatives
- Predictable that initiators will want to run with their ideas
- Weigh backfill against disappointment

The Mountain Bike



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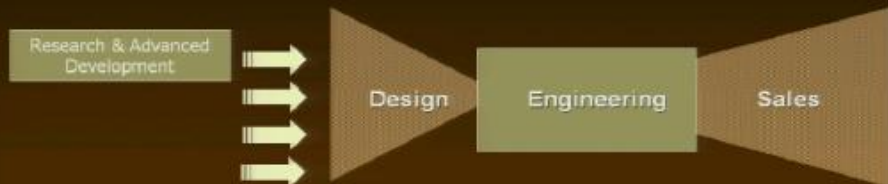
www.trek bikes.com

www.billbuxton.com

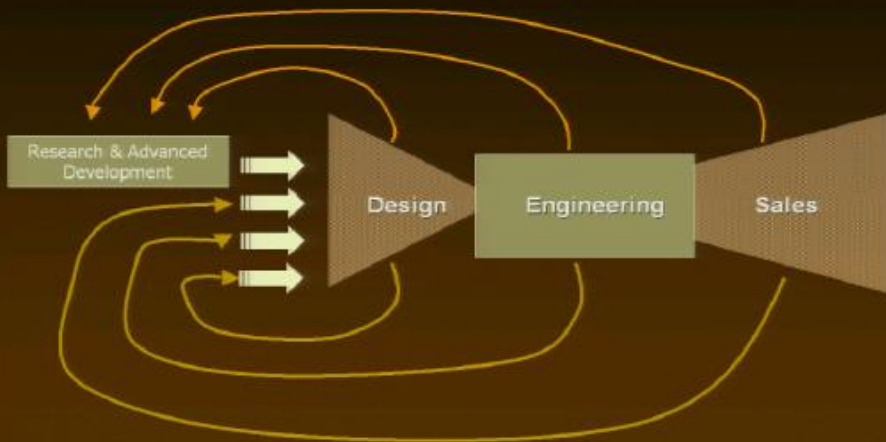


www.specialized.com
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Feeding the Funnel



Feeding the Funnel

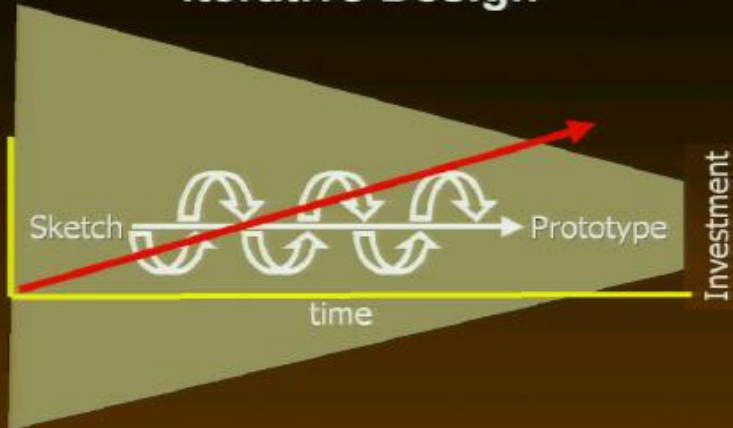


Anatomy of User Centred Design Process

- Iteration
- Sketching
- Prototyping
- Research
- Testing
- Analysis
- Shared reference material

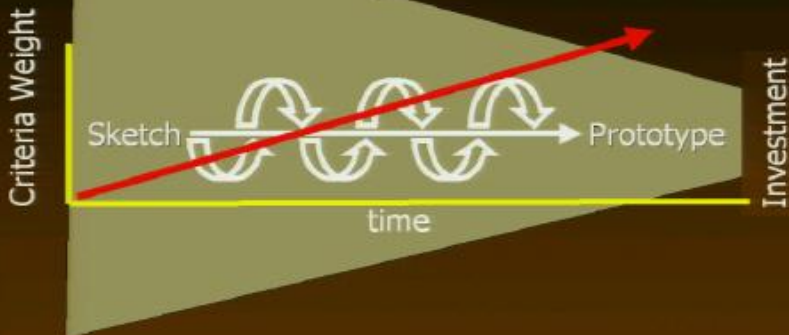
Iterative Design

Criteria Weight



Investment

Iterative Design



- **Sketching \neq Prototyping**

A Juicy Tale

Interface vs Experience

A Juicy Tale

Interface vs Experience



A Juicy Tale

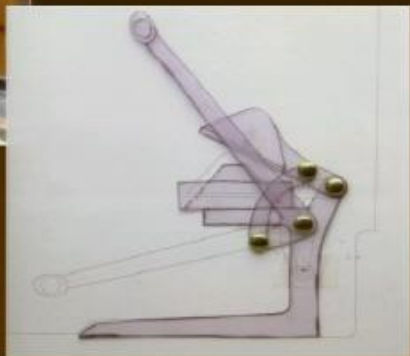
Interface vs Experience

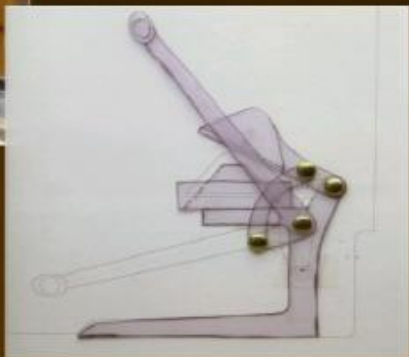


A Juicy Tale Interface vs Experience











Interface





interface



experience



The Second Worst Thing that can Happen: A Comment on Relevance:

Mirror into the future:

Company	Product
IBM (Lotus)	1-2-3
Macromedia (Macromind)	Director (VideWorks)
Alias Systems (Alias Research)	Studio (Alias/1)
Adobe	Illustrator
Adobe	Photoshop
Alias Systems (Alias Wavefront)	Maya

Mirror into the future:

Product
1-2-3
Director
Studio
Illustrator
Photoshop
Maya

2004

Mirror into the future:

Product

1-2-3

Director

Studio

Illustrator

Photoshop

Maya

Mirror into the future:

2004

Product

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Director

Studio

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Mirror into the future:

2004

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1-2-3

Director

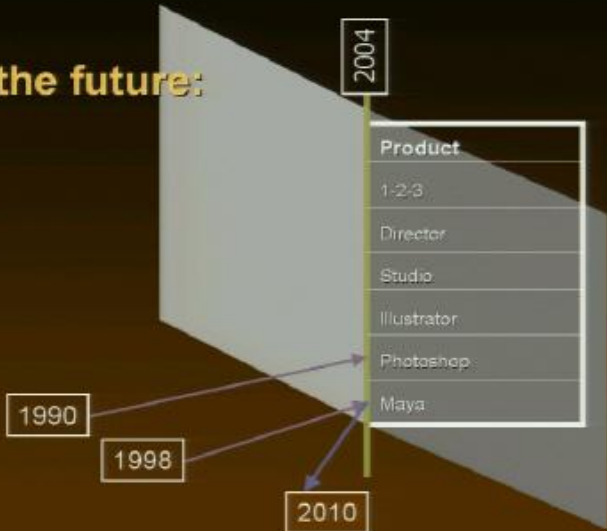
Studio

Illustrator

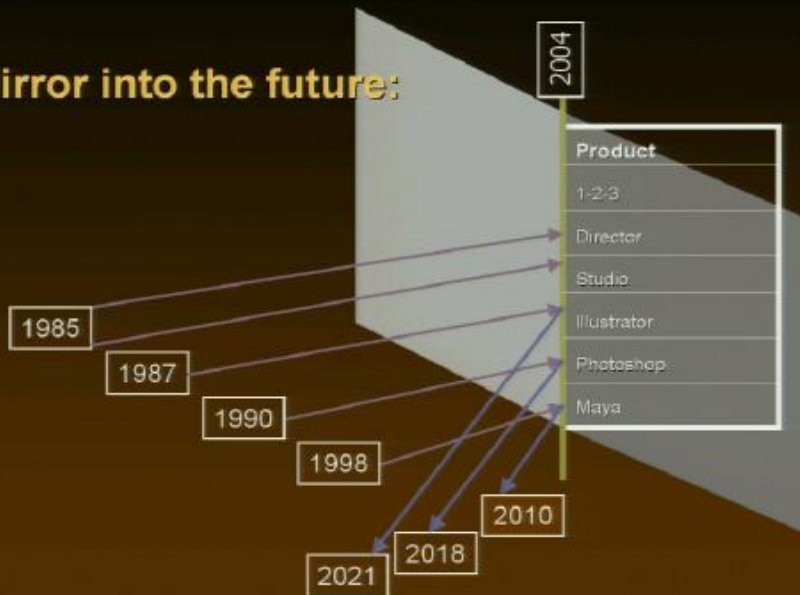
Photoshop

Maya

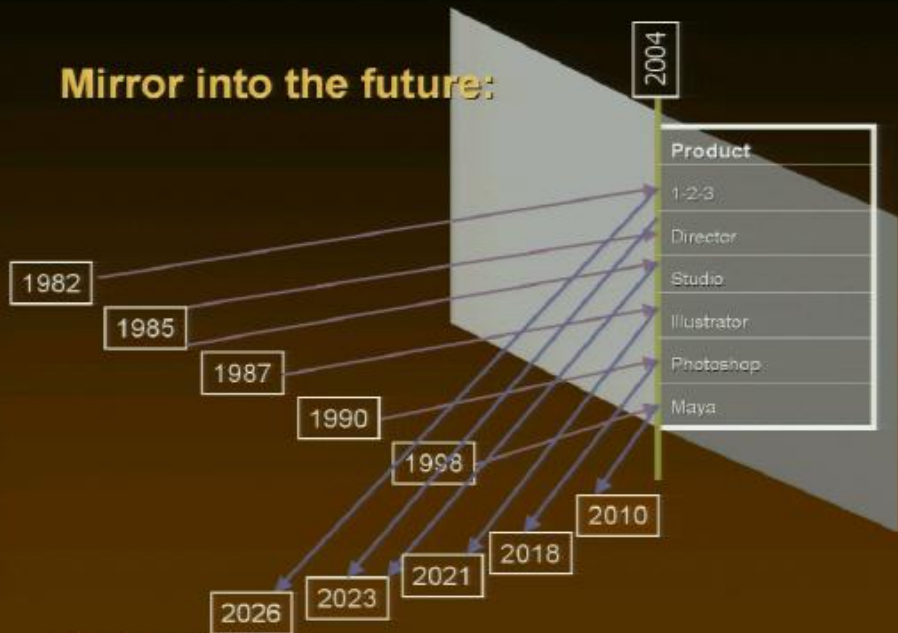
Mirror into the future:



Mirror into the future:



Mirror into the future:





Remember:

- Moore's law is not a myth
- Networking, for example = $2 \times$ Moore's Law
- What will the computational ecology be in that time frame?
- How will your design decisions look in that ecology?
- Yesterday's success is tomorrow's legacy code.
- Yesterday's success is tomorrow's straightjacket.

The “A River Runs Through It” Model



Thoughts on Relevance

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Thoughts on Relevance



- Design Saved Apple
- ID disjoint from SW
- With ubicomp product HW & SW design increasingly intertwined

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- Various cultures have to work together



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Thoughts on Relevance



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- With ubicomp product HW & SW design increasingly intertwined
- Note design of business model also integral
- Various cultures have to work together
- Overall ecology limited by weakest link
- Relevant regardless of HW appliance, application SW, server, middleware, etc.



Sketchbook



NO SIGNAL

Folders	Name	Size	Type	Date Modified
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	gdipus.dll	1,561 KB	Application Extension	8/29/2002 10:57 AM
	pan.png	6 KB	PNG Image	10/10/2002 3:36 PM
	PanZoomGDI2.exe	112 KB	Application	10/11/2002 10:20 AM
	pu-d0.png	17 KB	PNG Image	10/11/2002 9:16 AM
	pu-d1.png	17 KB	PNG Image	10/11/2002 9:16 AM
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	pu-d4.png	16 KB	PNG Image	10/11/2002 9:18 AM
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	zoom.png	5 KB	PNG Image	10/10/2002 3:37 PM

Date Created: 10/11/2004 10:57 AM
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